

The Radiologist as an Anatomy Student

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Anatomy is a foundational discipline for the study of medicine, but it lies at the very core of radiology. Essentially, every image a radiologist inspects depicts anatomy, and one of the very first determinations to be made is whether the anatomy in question is normal or abnormal: is the bone fractured, the bile duct dilated, or the subarachnoid space filled with blood? Along with surgery, radiology is one of the most anatomy-intensive fields in medicine. Without a thorough understanding of the structure of the human organism, it is impossible to do anything.

This makes it somewhat ironic that, although radiologists in training are required to revisit pathology in the form of radiology–pathology correlation, there is no requirement for advanced study in anatomy. To some degree, it is reasonable to expect that residents and fellows will learn it in the course of daily clinical work—reviewing the anatomy of the brain when they are on neuroradiology rotations, the anatomy of the heart when doing cardiovascular imaging, and the anatomy of the liver when rotating through abdominal imaging.

But if learning at the workstation suffices, why require additional study in radiologic pathology—a mandate that many residents meet by attending the American Institute for Radiologic Pathology—and yet provide no equivalent learning opportunity for the study of anatomy? It is not our purpose here to argue that residents should attend an analogous radiologic anatomy course, but we do wish to highlight the immense potential value—for radiologists at all stages of career development—of pursuing additional study in anatomy.

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A single course in the first year of medical school is insufficient to enable radiologists to grasp at a theoretical level, correlate clinically, and savor the full fruits of what close study of anatomy has to offer. This rite of passage in anatomy is often likened to drinking from a fire hose—so much material coming so fast that it is difficult simply to assimilate, let alone appreciate. Only later, as students take other preclinical science and clinical courses, does the true significance of anatomy begin to emerge in something approaching a mature form.

One advantage of getting radiologists reengaged in the study of anatomy is the fact that they can lend their clinical acumen to other learners study. For example, when a senior radiology resident or fully qualified radiologist appears in the classroom or the anatomy laboratory, they can often provide enlightening clinical correlations, helping both teachers and students to understand the potential relevance of what they are learning and organize their approach to the material in a way that will make it as useful as possible.

This same perspective can dramatically enhance the learning of radiologists who approach the material the second time around. Imagine, for example, how helpful it could be in learning the anatomy of the rotator cuff to have seen firsthand some of the more common injuries that can befall the shoulder or to approach the study of spinal cord anatomy with a thorough understanding of the different disease processes that can beset it. With clinical experience, every “seed” of anatomic information falls on far more fertile soil in the mind of the learner.

Of course, another contribution radiologists can make to the teaching of anatomy is to take full advantage of radiologic images as learning aids. Cadaver dissection has a central and probably irreplaceable role to play, but most physicians regularly encounter internal anatomy of the human body not through direct inspection but by viewing radiologic studies. By incorporating relevant clinical radiologic imaging into

the teaching of anatomy, learners can begin visualizing it in the same form they will see it throughout their careers.

Revisiting anatomy is not only useful. It is also an eye-opening and enjoyable experience. Full-time anatomists know a great deal about the body that clinical radiologists may never have learned, and seeing human structure through their eyes offers an even deeper and better informed understanding. It is almost like laying down a second foundation of anatomic insight, which can be especially helpful in appreciating subtleties such as vascularization and innervation that otherwise can be easily overlooked in routine clinical imaging.

Another huge contribution lies in the area of embryology. Well-educated anatomists operate with a deep understanding of the vertebrate body plan, which plays a huge role in explaining how and why we came to be structured the way we are. Some structures, such as the inside-out eye or the spine, which originally developed to support quadrupeds, simply do not make sense unless we can situate them in the context of their evolutionary history. Having seen what can go wrong with such structures, the embryology takes on a new level of meaning.

Of course, it would be a challenge for many contemporary radiologists to find the time to attend medical school anatomy lectures and laboratory sessions. Such courses are often scheduled at peak times in the workday of a clinical radiologist. To take time out of the clinical schedule to be present would undermine the productivity of both individual radiologists and whole departments, and especially in this day and age and even in academic practice, this is a sacrifice that many in radiology will be unwilling to make.

However, there are alternatives. At many schools, medical school lectures are being recorded, so that both video and audio are available for learners to view and review at their leisure. Many faculty members invest considerable time and effort in making such presentations high-yield, visually and intellectually

engaging experiences. Particularly for radiologists who already have faculty appointments, it should be a relatively simple matter to gain online access to such material, which can be viewed any time, day or night.

The fact that the content of each class session is usually well described makes it easy for radiologists to pick and choose which sessions are most worth attending to. For example, a neuroradiologist who focuses on ENT imaging could make a special effort to tune in to the temporal bone sessions, whereas a pediatric radiologist who deals regularly with a variety of congenital disorders might find embryologic sessions particularly helpful. On the other hand, a breast imager might opt out of these sessions but devote particular attention to a class on the lymphatic system.

This enhanced anatomic understanding can be put to use in many ways, the most readily apparent of which is to enrich the quality of daily clinical work. The better radiologists understand the anatomy, the better equipped they are to interpret the images before them. In addition, enhanced anatomic understanding can be of immense educational value, by enabling radiology educators to ask more anatomy-based questions and help to enrich the anatomic understanding of medical students, residents, and colleagues they work with.

Educationally, another use for such sessions would be to assign them to residents and other learners who rotate through a particular section of the radiology department. For example, learners on a neuroradiology rotation might be assigned to watch each of the class sections that are devoted to neuroanatomy or to focus on a few that, in the opinion of the radiology educator, are particularly clinically relevant or well done. End-of-rotation tests and evaluations could even draw on this material as a means of assessing learner performance.

Of course, some programs have an even closer association with anatomy. There are medical schools at which the primary responsibility for teaching anatomy rests with the radiology department or in which a radiology faculty member is the director for the anatomy course. In such circumstances, the opportunity for integrating anatomy into radiology education is particularly auspicious. There is, however, also a danger, to the degree that anatomists are replaced with radiologists; the advantages of the distinctively anatomic perspective are likely to be lost.

In sum, to be a radiologist means more than merely grinding diagnoses out of large collections of imaging findings. It should also mean developing a deep and enduring appreciation for the intricacy and beauty of the human form. Consider these words from Shakespeare's Hamlet:

What a piece of work is man! How noble in reason,
how infinite in faculty! In form and moving how express
and admirable! In action how like an Angel! In
apprehension how like a god! The beauty of the world!
The paragon of animals!

The point is not just that the human form itself is beautiful but also that the power of beholding its richness and complexity is itself something worth celebrating and one that deserves to be cultivated and savored throughout a career.